CLAIMS

The invention claimed is:

1. A method of forming a deuterated silicon nitride-containing material comprising a deposition utilizing at least one deuterated nitrogen compound and one or more silicon-containing compounds that do not contain hydrogen isotopes.

2. The method of claim 1 wherein the deuterated silicon nitride-containing material is a deuterated silicon oxynitride-containing material.

3. The method of claim 1 wherein the deposition is one or both of an atomic layer deposition and a chemical vapor deposition.

4. The method of claim 1 wherein the deposition is a chemical vapor deposition conducted at a pressure of less than or equal to about 5 Torr.

5. The method of claim 1 wherein the at least one deuterated nitrogen compound is selected from the group consisting of NH_2D, NHD_2, ND_3, and mixtures thereof.

6. The method of claim 1 wherein the one or more silicon-containing compounds consist of silicon and chlorine.

7. The method of claim 6 wherein the one or more silicon-containing compounds are selected from the group consisting of $SiCl_4$, Si_2Cl_6 and mixtures thereof.

8. The method of claim 7 wherein the at least one deuterated nitrogen compound is selected from the group consisting of NH_2D, NHD_2, ND_3, and mixtures thereof.

9. The method of claim 8 wherein the one or more silicon-containing compounds are halogenated silicon compounds, wherein the deposition occurs in a reaction chamber, wherein a total volume of the at least one deuterated nitrogen compound provided in the chamber is defined as a deuterated nitrogen compound volume; wherein a total volume of the one or more halogenated silicon compounds provided in the chamber is defined as a halogenated silicon compound volume; and wherein a volume ratio of the deuterated nitrogen compound volume to the halogenated silicon compound volume during the deposition is from about 1:1 to about 20:1.

10. The method of claim 9 wherein a temperature within the reaction chamber is maintained at from about 500°C to about 850°C during the deposition.

11. The method of claim 10 wherein a pressure within the reaction chamber is maintained at less than or equal to about 5 Torr during the deposition.

12. The method of claim 1 wherein the deuterated silicon nitride-containing material consists essentially of silicon nitride.

13. The method of claim 1 wherein the deuterated silicon nitride-containing material consists of silicon nitride.

14. The method of claim 1 wherein the deuterated silicon nitride-containing material is formed directly against an electrically conductive component of a wordline in a semiconductor construction.

15. The method of claim 14 wherein the electrically conductive component comprises p-type doped silicon.

16. A method of forming a deuterated silicon nitride-containing material comprising a deposition utilizing at least one deuterated nitrogen compound and one or more silicon-containing compounds consisting of silicon and one or more halogens.

17. The method of claim 16 wherein the one or more silicon-containing compounds comprise at least one of $SiCl_4$ and Si_2Cl_6.

18. The method of claim 16 wherein the at least one deuterated nitrogen compound is selected from the group consisting of NH_2D, NHD_2, ND_3, and mixtures thereof.

19. A method of forming a deuterated silicon nitride-containing material proximate an interface of silicon dioxide with non-oxidized silicon, comprising:

providing a construction comprising a silicon dioxide-containing material directly against a surface comprising non-oxidized silicon; the interface of the silicon dioxide and the non-oxidized silicon occurring where the silicon dioxide-containing material and the non-oxidized silicon join; and

depositing a deuterated silicon nitride-containing material over the silicon dioxide-containing material; the deuterated silicon nitride-containing material being deposited from at least one deuterated nitrogen compound and one or more halogenated silicon compounds that do not contain hydrogen isotopes.

20. The method of claim 19 wherein the deuterated silicon nitride-containing material is a deuterated silicon oxynitride-containing material.

21. The method of claim 19 wherein the at least one deuterated nitrogen compound is selected from the group consisting of NH_2D, NHD_2, ND_3, and mixtures thereof.

22. The method of claim 19 wherein the one or more halogenated silicon compounds consist of silicon and chlorine.

23. The method of claim 22 wherein the one or more halogenated silicon compounds are selected from the group consisting of $SiCl_4$, Si_2Cl_6 and mixtures thereof.

24. The method of claim 19 wherein the non-oxidized silicon is monocrystalline silicon.

25. The method of claim 19 further comprising forming an electrically conductive material over the silicon dioxide-containing material, and wherein the deuterated silicon nitride-containing material is formed directly against the electrically conductive material.

26. The method of claim 25 wherein the electrically conductive material comprises p-type doped silicon.

27. The method of claim 25 further comprising etching the electrically conductive material and the deuterated silicon nitride-containing material into a wordline.

28. The method of claim 27 wherein the wordline has a pair of opposing sidewalls, the method further comprising forming deuterated silicon nitride-containing liners along the sidewalls from at least one deuterated nitrogen compound and one or more halogenated silicon compounds that do not contain hydrogen isotopes.

29. The method of claim 27 wherein the deuterated silicon nitride-containing material is a first deuterated silicon nitride-containing material, wherein the wordline has a pair of opposing sidewalls; and the method further comprising, after forming the wordline:

forming deuterated silicon nitride-containing liners along the sidewalls from at least one deuterated nitrogen compound and one or more halogenated silicon compounds that do not contain hydrogen isotopes; and

forming a second deuterated silicon nitride-containing material over the first deuterated silicon nitride-containing material and over the deuterated silicon nitride containing liners; the second deuterated silicon nitride-containing material being formed from at least one deuterated nitrogen compound and one or more halogenated silicon compounds that do not contain hydrogen isotopes.

30. The method of claim 29 further comprising forming a pair of source/drain regions proximate a portion of the wordline to incorporate the portion of the wordline into a transistor device.

31. The method of claim 30 wherein a passivation anneal is conducted after forming the first deuterated silicon nitride-containing material, the second deuterated silicon nitride-containing material, and the deuterated silicon nitride-containing liners; the passivation anneal comprising heating the silicon dioxide-containing material and the non-oxidized silicon to a temperature of from about 350°C to about 450°C for a time of from about 5 minutes to about 2 hours.

32. The method of claim 30 further comprising incorporating the transistor device into a DRAM cell.

33. The method of claim 32 further comprising incorporating the DRAM cell into an electronic system.

34. A method of forming electrically insulative sidewall liners along sidewalls of an electrically conductive line, comprising:

forming an electrically conductive line over a semiconductor substrate; the line comprising a pair of opposing sidewalls;

depositing a deuterated silicon nitride-containing material along the sidewalls and over the semiconductor substrate; the deuterated silicon nitride-containing material being deposited from at least one deuterated nitrogen compound and one or more halogenated silicon compounds that do not contain hydrogen isotopes; and

anisotropically etching the deuterated silicon nitride-containing material to form sidewall liners along the sidewalls of the line.

35. The method of claim 34 wherein the deposition of the deuterated silicon nitride-containing material is one or both of atomic layer deposition and chemical vapor deposition.

36. The method of claim 34 wherein the deposition of the deuterated silicon nitride-containing material is chemical vapor deposition conducted at a pressure of less than or equal to about 5 Torr.

37. The method of claim 34 wherein the at least one deuterated nitrogen compound is selected from the group consisting of NH_2D, NHD_2, ND_3, and mixtures thereof.

38. The method of claim 34 wherein the one or more halogenated silicon compounds consist of silicon and chlorine.

39. The method of claim 38 wherein the one or more halogenated silicon compounds are selected from the group consisting of $SiCl_4$, Si_2Cl_6 and mixtures thereof.

40. The method of claim 39 wherein the at least one deuterated nitrogen compound is selected from the group consisting of NH_2D, NHD_2, ND_3, and mixtures thereof.

41. The method of claim 34 wherein the deuterated silicon nitride-containing material consists essentially of silicon nitride.

42. The method of claim 34 wherein the deuterated silicon nitride-containing material consists of silicon nitride.

43. A method of forming a transistor device, comprising:

forming a gate stack over a semiconductor substrate; the gate stack comprising an electrically insulative pad, at least one electrically conductive material over the pad, and an electrically insulative cap over the at least one electrically conductive material; the gate stack comprising a pair of opposing sidewalls extending at least along the one or more conductive materials and the cap;

forming an electrically insulative material along the sidewalls;

anisotropically etching the electrically insulative material to form sidewall spacers along the sidewalls;

implanting dopant into the substrate proximate the gate stack to form a pair of source/drain diffusion regions gatedly connected to one another through the gate stack; and

depositing a deuterated silicon nitride-containing material over the gate stack and over the sidewall spacers; the deuterated silicon nitride-containing material being deposited from at least one deuterated nitrogen compound and one or more halogenated silicon compounds that do not contain hydrogen isotopes.

44. The method of claim 43 wherein the deuterated silicon nitride-containing material is a deuterated silicon oxynitride-containing material.

45. The method of claim 43 wherein the electrically insulative material formed along the sidewalls and used to form the sidewall spacers is a deuterated silicon nitride-containing material deposited from at least one deuterated nitrogen compound and one or more halogenated silicon compounds that do not contain hydrogen isotopes.

46. The method of claim 43 wherein the electrically insulative cap is a deuterated silicon nitride-containing material deposited from at least one deuterated nitrogen compound and one or more halogenated silicon compounds that do not contain hydrogen isotopes.

47. The method of claim 46 wherein the electrically insulative material formed along the sidewalls and used to form the sidewall spacers is a deuterated silicon nitride-containing material deposited from at least one deuterated nitrogen compound and one or more halogenated silicon compounds that do not contain hydrogen isotopes.

48. The method of claim 43 wherein the depositing is chemical vapor deposition conducted at a pressure of less than or equal to about 5 Torr.

49. The method of claim 43 wherein the at least one deuterated nitrogen compound is selected from the group consisting of NH_2D, NHD_2, ND_3, and mixtures thereof.

50. The method of claim 43 wherein the one or more halogenated silicon compounds consist of silicon and chlorine.

51. The method of claim 50 wherein the one or more halogenated silicon compounds are selected from the group consisting of $SiCl_4$, Si_2Cl_6 and mixtures thereof.

52. The method of claim 51 wherein the at least one deuterated nitrogen compound is selected from the group consisting of NH_2D, NHD_2, ND_3, and mixtures thereof.

53. The method of claim 43 wherein the deuterated silicon nitride-containing material consists essentially of silicon nitride.

54. The method of claim 43 wherein the deuterated silicon nitride-containing material consists of silicon nitride.

55. The method of claim 43 wherein a passivation anneal is conducted after forming the deuterated silicon nitride-containing material; the passivation anneal comprising heating the substrate to a temperature of from about 350°C to about 450°C for a time of from about 5 minutes to about 2 hours.

56. The method of claim 43 further comprising incorporating the transistor device into a DRAM cell.

57. The method of claim 56 further comprising incorporating the DRAM cell into an electronic system.